BLM LIBRARY
88019151

U.S. DEPARTMENT OF INTERIOR
Bureau of Land Management

Oregon State Office August 1985

Rangeland Monitoring In Oregon & Washington

SF
85.35
.07
R3633
1985

#21422919
ID88019151

March 3, 1849

United States Department of the Interior

BUREAU OF LAND MANAGEMENT

OREGON STATE OFFICE
P.O. Box 2965 (825 NE Multnomah Street)
Portland, Oregon 9720

BLM LIBRARY
SC-324A, BLDG. 50
DENVER FEDERAL CENTER
P.O. BOX 25047
80225-0047

IN REPLY REFER TO:

SF
85.35
.07
R3633
1985

"Rangeland Monitoring in Oregon & Washington" provides guidance to BLM offices and information to user groups and the public on a minimum rangeland monitoring program. The objectives are to:

- -- cover major items committed to in land use plans
- -- outline minimum standards and frequency of studies
- -- provide some flexibility in specific methods
- -- provide for interdisciplinary team review and recommendations
- -- stress close coordination between districts and adjacent states
- -- encourage user group and public involvement in the monitoring program
- -- allow previously established and on-going studies to continue
- -- provide a realistic and affordable program
- -- produce a base document that can be built upon.

These objectives have been met. We in the Task Force recommend adoption of "Rangeland Monitoring in Oregon and Washington" for immediate use.

James L. Hancock
James L. Hancock
Associate DM - Prineville
Team Leader

William A Reimers
Bill Reimers
Range Conservationist - Burns

Robert R. Kindschy
Robert Kindschy
Wildlife Biologist - Vale

Scott Whittaker
Scott Whittaker
Soil Scientist - Spokane

Joe Kraayenbrink
Joe Kraayenbrink
Range Conservationist - Lakeview

Robert [illegible] for John Simons
John Simons
Range Conservationist - Medford

Jean M. Findley
Jean Findley
Monitoring Specialist - Vale

Larry L. Walker
Larry Walker
Range Resource Studies Specialist
Oregon State Office

Concurrence:

William G. Leavell
William G. Leavell
State Director

8/5/85

PREAMBLE

The Oregon/Washington Minimum Rangeland Monitoring Standards Task Force has completed the first edition of "Rangeland Monitoring in Oregon & Washington." The draft document was prepared by a interdisciplinary team of BLM District and Oregon State Office employees.

In developing the draft, the Task Force analyzed previous guidance developed within Oregon/Washington and reviewed monitoring publications from adjoining States, BLM's Washington Office and Denver Service Center (DSC), and the Oregon State University Extension Service. Whenever possible, material from these documents was incorporated into the Oregon/Washington guidance with the objective being to develop a level of long-term consistency in the BLM Monitoring Program and to promote understanding among BLM employees, user groups and the public.

This draft was circulated in all affected BLM offices in Oregon and Washington, adjoining BLM State Offices, the Headquarters Office and the Denver Service Center. In addition, it was sent to other appropriate federal and state agencies, university staff in Oregon/Washington and adjoining states and key public land interest and user groups. A formal presentation to the Coordinated Resource Management Planning (CRMP) Executive Committee and other interested parties was made during the public review period. Valuable input and suggestions for improving the document were received from a number of the reviewers. Each comment received was thoroughly analyzed by the Task Force as a group and, where appropriate, changes were made in the draft. In addition, the Task Force benefited from the public participation that occurred during the preparation of the other monitoring documents that were analyzed.

Close coordination and frequent communication between offices, both within Oregon/Washington and with Districts in adjacent states is deemed critical to the success of future monitoring efforts. Coordination and cooperation with public land users is also essential to the monitoring program. The affected publics should be actively involved in the monitoring program.

"Rangeland Monitoring in Oregon & Washington" outlines the minimum monitoring elements committed to in current rangeland program summaries and defines the minimum frequency for completing each element. The monitoring elements are the minimum required and are not intended to be all inclusive. They do not preclude the use of additional methods or intensities where resource conditions or values dictate and budgets allow.

Table of Contents

Page

INTRODUCTION 1

MINIMUM STANDARDS (TABLE 1) 3

MONITORING ELEMENTS 4
- Condition 4
- Trend 8
- Utilization 11
- Actual Use 12
- Climate 12
- Sensitive, Threatened or Endangered Species 13
- Fish and Wildlife 14
- Wild Horses 15
- Water Quality 15
- Other Elements 16

ANALYSIS 16
- Data Compilation 16
- Interpretation 16
- Evaluation 17

DOCUMENTATION 21
- Record Keeping 21
- Reporting 21

APPENDICES
- Appendix 1 - Rangeland Classification 22
- Appendix 2 - Observed Apparent Trend 28
- Appendix 3 - Nearest Plant Method 32
- Appendix 4 - Nested Frequency Method 35
- Appendix 5 - Modified Line Intercept Method 36
- Appendix 6 - Sensitive, Threatened or Endangered Species 40
- Appendix 7 - Modified Cole Browse Method 45

ILLUSTRATIONS
- Illustration 1 - Record Keeping 48

LIST OF PREPARERS 49

GLOSSARY OF TERMS 50

RANGELAND MONITORING IN OREGON AND WASHINGTON

INTRODUCTION

Resource managers need a consistent approach for collecting and using rangeland monitoring information. This document explains the minimum standards and a selection of techniques to be consistently applied. The document is intended to provide a sound and practical approach for rangeland monitoring in Oregon/Washington.

Monitoring Serves Several Purposes

-To meet the requirement of the Bureau regulations, 43 CFR 1610.4-9 for monitoring Bureau land-use plans, in accordance with established intervals and standards.

-To meet the requirement of the regulations implementing the National Environmental Policy Act, 40 CFR 1505.2(c), that a monitoring program shall be adopted for any mitigation incorporated into decisions based on environmental impact statements.

-To provide feedback to BLM managers on the consequences of actions taken, so these actions can be adjusted, if appropriate, and to improve subsequent decision making.

-To provide opportunity for both Bureau professionals and others (including the interested public) to systematically track the consequences of Bureau actions and ascertain whether resource objectives are being met.

To meet the increased rangeland monitoring workload resulting from the cited legal requirements and the recent completion of land-use plans, related grazing environmental impact statements, and Rangeland Program Summaries (RPS) for most public rangelands in Oregon and Washington, a minimum Monitoring Standards Task Force was formed by the BLM Oregon State Director in May 1985. The Task Force was charged with establishing "minimum rangeland monitoring standards" designed to fit within current and future budgets.

Monitoring means the orderly collection, analysis, and interpretation of resource data to evaluate progress in meeting management objectives. Monitoring is conducted to find out what is happening and why it is happening in relationship to specific management objectives.

This document discusses both short-term and long-term monitoring. Short-term monitoring documents the nature of grazing use and other important events of recent occurrence. This information is used to make seasonal or annual adjustments. Long-term monitoring documents changes in resources over time. It documents progress toward meeting objectives identified in management plans.

This document was written to be used by resource managers to accomplish minimum requirements. The monitoring elements discussed are not intended to be all-inclusive. The procedures should be considered as a standard approach for monitoring and should not preclude the use of additional methods or intensities where resource conditions or values dictate.

The Task Force reviewed and considered the rangeland monitoring elements of condition, trend, utilization, actual use, climate and other studies committed to in RPSs or as described in BLM Manual Section 4400. It further considered the analysis of these elements. Table 1 outlines the "minimum standards" (element and frequency) which will be conducted in accordance with approved monitoring plans as required by BLM Manual Section 4400.22. All new monitoring plans and revisions of approved monitoring plans will be submitted to the Deputy State Director for Lands and Renewable Resources for concurrence.

All monitoring activities will be conducted within a framework of coordination and consultation as required by BLM Manual Sections 4400.5 and 4400.6.

TABLE 1
MINIMUM STANDARDS
(Monitoring Elements and Frequency)

Monitoring	Selective Management Category 1/		
Element	Improve	Maintain	Custodial
Condition 2/3/	15 years	15 years	15 years
Trend 2/	5 years	10 years	10 years
Utilization	Annually	3 years	As needed
Actual Use	Annually	Annually	Annually where needed
Climate	Annually for crop year precipitation from NOAA weather stations		
Sensitive, Threatened or Endangered Species 2/			
Threatened & Endangered	Annually, or as required by a "may effect" determination resulting from formal consultation with U.S. Fish and Wildlife Service		
Sensitive	As frequently as required to develop baseline population trend data.		
Fish and Wildlife			
Populations	Annually as provided in cooperation with State Wildlife Agencies or as specified in HMPs		
Habitat	5 years	10 years	10 years
Horses 2/			
Populations	Inventory every other year		
Habitat	As per first five monitoring elements above		
Water Quality 2/	12 - 15 samples per year per station		

1/ See Glossary for description of Selective Management Categories.
2/ Required by law.
3/ Condition includes Ecological Status

MONITORING ELEMENTS

The preceding table outlines the minimum standard elements and frequency for monitoring Oregon/Washington rangelands. This section discusses methodologies for accomplishing minimum standard elements and provides additional guidance for method selection.

Appropriate method selection can occur only after determining specific land-use objectives to be monitored and evaluating costs relative to resource values, levels of conflict or controversy, potential for improvement or deterioration, and other aspects of the area to be monitored. Where these factors are minimal, selection of the least intensive and generally least expensive methods is appropriate. Where these factors are the greatest, selection of the most intensive and generally most expensive methods is necessary. In all cases, care must be exercised to ensure that the selected methods do, in fact, monitor progress in achieving land-use objectives.

Professional judgment and adequate use supervision must be integral parts of any monitoring program. This is essential for evaluating the validity of monitoring data, identifying cause and effect relationships, and giving adequate consideration to very important intangible or difficult to monitor factors that are associated with any land management program. In areas where conflicts, controversy, improvement potential, risks, and other factors are minimal, professional judgment, alone or in conjunction with photographs, may be adequate for some monitoring elements. Photographs provide a visual record of the results of land management and should be an integral part of most monitoring methods.

Condition

Condition is a generic term relating to the present status of a unit in terms of specific values or potentials.

Because it is a generic term, condition has been used in many ways. This produces confusion and causes frequent misinterpretation in the process of communicating. Therefore, the BLM within Oregon/Washington will strive to achieve consistency for the monitoring program by adhering to the concepts outlined in this section.

All personnel involved in the program must recognize that concepts of rangeland classification are undergoing rapid evolution resulting in numerous changes in definitions. Additional changes are inevitable as concepts are refined. Therefore, all affected personnel must understand the concepts presented in this section and be prepared to explain the meaning of their monitoring data to others. Some conversion of terminology for various forms of reporting will be inevitable. This further increases the need for affected personnel to understand the concepts involved.

This monitoring element includes the following kinds of "conditions:"

Ecological Status

Ecological Status is frequently referred to as "ecological condition," "ecological range condition" or "range condition." Accurate communication requires that the "condition" terms no longer be used for this sub element.

Ecological Status is use-independent and refers to the relationship of the present plant community on a unit of land to the plant community that would be the natural potential for that kind of land (Ecological Site) in the absence of abnormal disturbances.

Ecological Status is classified as one of four Seral Stages based on the degree to which the present plant community is similar to the potential natural community (PNC) for the kind of land being classified. The names of these Seral Stages are PNC, Late Seral, Mid Seral, and Early Seral for plant communities that are 76-100 percent, 51-75 percent, 26-50 percent and 0-25 percent similar to PNC. Ecological Status is determined and mapped in accordance with BLM Manual Section 4410, Ecological Site Inventory (ESI).

Because it is use-independent and relates the present resource to the natural potential, Ecological Status has these important features:

--It provides a consistent baseline for monitoring. Use-dependent classifications can change if land management objectives change, thereby rendering all previous land classification and monitoring invalid even though the actual resources may not have changed. Because Ecological Status is use-independent, it will not change unless there is an actual change in resources.

--Because it is based on the natural capability of the land, Ecological Status provides an essential foundation for determining "Range Condition" as defined and required by sections 2(b)(1), 3(d), and 4(a) of the Public Rangelands Improvement Act of 1978 (PRIA).

--When used with the Resource Value Rating (RVR) process of interpretation, Ecological Status provides a basis for identifying land-use options and values for a multitude of resources and uses from inventorying or monitoring only two basic variables (Ecological Site and Ecological Status).

In the semi-arid environment of most Oregon/Washington rangelands, Ecological Status usually changes very slowly. Therefore, the minimum standard for updating Ecological Status is keyed to the estimated land-use planning cycle (15 years) unless other monitoring studies indicate a need for more frequent updating.

Appendix 1 contains further discussion and definition of Ecological Status and related factors. That appendix also provides procedures for rating Seeding Status in lieu of Ecological Status where rangeland revegetation projects have created replacement plant communities. Seeding Status should be used only where a substantial proportion of plants that would not be components of the PNC have been intentionally introduced. In all other cases, such as revegetation with native plants, Ecological Status should be used.

Range Condition

"Range condition" has probably been defined and used in more ways than any of the other resource "condition" terms. However, there is now a legal definition for "Range Condition" as the term applies to rangelands administered by BLM.

Section 3(d) of the Public Rangelands Improvement Act of 1978 (PRIA) defines Range Condition. The PRIA definition is a complex construction consolidating portions of a number of different concepts, but these points are dominant:

> --Range management objectives and the land-use planning process are the primary factors that must be considered in determining Range Condition.
>
> --The ability of the land to support vegetation, and the kind of vegetation the land could support as a result of the natural vegetative process (PRIA Section 3(e)), must be considered in determining Range Condition.
>
> --All of the applicable multiple use values of an area must be considered in determining Range Condition.

The PRIA definition could be interpreted to require determination of many different "range conditions" for a single unit of land. That would not be practical and is not necessary. Such an interpretation overlooks the PRIA emphasis on range management objectives and the land-use planning process mandated in Section 202 of the Federal Land Policy and Management Act of 1976 (FLMPA). When the PRIA definition is viewed within the context of vegetation, objectives and land-use planning, it becomes possible to satisfy the PRIA requirements with one kind of "Range Condition."

Any given unit of land has the ability to produce several kinds of plant communities at different times, but only one plant community can occupy the same land unit at a single time. The different plant communities are usually optimal for different uses or mixtures of uses. These alternatives and the needs and wants of society are evaluated in the land-use planning process, conflicts are resolved in favor of one or more uses, and land management objectives are developed for specific units of land that can best be satisfied by one of the alternative plant communities the land is capable of supporting.

Therefore, the PRIA definition of "Range Condition" can be more simply stated as "the degree to which the present plant community resembles the plant community that best satisfies range management objectives." Within this context, Range Condition has these important features:

--Range Condition is partially use-dependent. It relates to the uses that received preference in establishing range management objectives for a specific unit of land, but it may be based on different uses or mixtures of uses for different units of land.

--Because it is based on objectives developed in the land-use planning process, which included the resolution of multiple-use conflicts, Range Condition is the single most meaningful measure of multiple-use management on rangelands.

--Where range management objectives are written in terms of desired Seral Stages, Range Condition does not require direct monitoring or inventory. Instead, it is readily synthesized by comparing the present Ecological Status and trends with the range management objectives. A new baseline inventory or change of monitoring methods is not required if additional planning, new policies, or other factors make it necessary to change management objectives. However, this assumes that the Ecological Site/Ecological Status/Resource Value Rating approach of land classification is being used. Otherwise a new baseline inventory and a change of monitoring methods could be necessary if a significant change occurs in management objectives.

Range Condition usually changes very slowly in semi-arid climates. Moreover, the preferred methodology is to determine Range Condition by interpreting Ecological Status and trends relative to range management objectives. Therefore, the minimum standard for updating Range Condition is also keyed to the estimated land-use planning cycle, unless other monitoring studies indicate a need for more frequent updating.

Range Condition may be classified as Good, Fair, Poor, or Bad depending on whether the present Ecological Status represents zero, one, two, or three Seral Stages of departure from the Ecological Status that would best satisfy range management objectives determined in the land use planning process.

Other Kinds of Condition

Most other kinds of vegetation-related "conditions" are actually Resource Value Ratings (RVR). Taken within this context, these other conditions may not require any specific monitoring in addition to the monitoring already required for Ecological Status and Range Condition. Because applicable RVRs are implicit in determination of Range Condition.

Vegetation is one of the more manageable aspects of rangeland. Many other resources and uses relate directly to the kind of plant communities present on the land. A determination should always be made on whether the vegetation-related monitoring will provide an adequate inference of other resource values before a commitment is made to monitor other kinds of condition.

If it is necessary to monitor other kinds of condition, then specific modifiers should always be added to the word "condition." For example: "livestock forage condition," "winter browse condition," and so forth. The term "Range Condition" should never be used except in the PRIA context.

Trend

Trend is also a generic term. It relates to direction of movement. In rangeland monitoring, trend is most frequently used to indicate whether management is resulting in resources changes that are either toward or away from an objective.

The primary purpose of trend studies is to detect direction of change within a time frame that will allow initiating prompt remedial action if trend is not in the desired direction. Trend study methods must be selected that will provide the needed sensitivity relative to the objectives being monitored and the desired time frame. This may result in the selection of methods that provide a good indication of the direction of change, but which are not capable of showing if the objective has actually been met. This is quite common. It occurs because the most cost-effective and sensitive method may be to monitor some "indicator".

Some of the more commonly used indicators of trend are change in cover, plant vigor, reproduction, erosion, litter, composition, production, frequency or density of plants, form class, plant conditions (e.g., hedging), age class and diversity index.

The primary needs for trend determinations on rangelands are for trend of Ecological Status and trend of Range Condition. These should always be called Ecological Trend and Range Trend. Where Ecological Sites, Ecological Status, and Resource Value Ratings are used to establish range management objectives, Range Trend can be interpreted from Ecological Trend (See Appendix 1).

Ecological Trend should be expressed as Toward (PNC), Not Apparent, or Away (from PNC). Range Trend (or trend in relation to other specific objectives) should be expressed as Up, Not Apparent, or Down. Always remember that Ecological Trend will not necessarily be in the same direction as Range Trend.

The minimum standard for trend is that it will be evaluated at least twice during the term of a 10-year permit or lease for category "I" allotments. Category "M" and "C" allotments will be evaluated for trend before renewal of a 10-year permit or lease.

Photographs provide a visual record of the results of land management and should be a part of most monitoring methods. Close-up and general view photographs should be taken when conducting trend studies.

Acceptable methods to meet minimum standards for monitoring trend include:

Observed Apparent Trend

This method (Appendix 2), consists of evaluating the apparent state of health of a unit of rangeland against a scorecard of soil and vegetation indicators. This method observes only a single point in time and, therefore, does not provide a measure of direction of movement over time. Instead, it provides an inference of what the trend might be, based on the current health of the range.

It should only be done by an experienced observer and should always be identified as observed apparent trend. This method may be appropriate for areas where a very low intensity of monitoring is adequate.

Reinventory

This is the ultimate form of monitoring. It does not rely on inferences, indicators, or limited key areas. Instead, it shows actual change over all areas included in the inventory. When reinventory is limited to updating Ecological Status, costs are competitive with other trend study methods.

Reinventory reflects only large changes (e.g. a full Seral Stage) and is not appropriate for detecting short-term changes.

Interpretation of Utilization, Actual Use, and Climate.

When the level of utilization is adjusted for the amount of actual use that produced the utilization, and for the growing conditions of forage and browse, it can provide a reliable estimate of forage or browse production. Therefore, it becomes a production-based trend study for forage and browse. This possible application should be considered when designing trend studies because it can affect the selection of key species, methods of determining utilization, transect layout, and so forth.

This may be one of the more sensitive and useful methods of monitoring trend because it directly monitors causes (utilization levels, timing and amounts of actual use, weather) while providing a reliable estimate of effects (production).

This method of monitoring trend is limited to situations where forage or browse production provides an adequate indication for the kind of trend being monitored. The method is useful for both short-term and long-term study.

Nearest Plant

The Nearest Plant method (Appendix 3) consists of a minimum of 100 observations along a transect at one pace, or other selected intervals. The observation is the nearest plant within a 180° arc from the center of the front of the observer's foot. Close-up and general view photographs should be used with this method.

This method provides an estimate of relative species dispersion. This is similar in concept to the frequency method, but the Nearest Plant method provides less information and is less sensitive for detecting change. The indicators of trend monitored with this method are the percentage of occurrence as nearest plant. The Nearest Plant method is very quick and inexpensive.

Nested Frequency

The Nested Frequency method (Appendix 4) consists of observing nested plots of various sizes along transects. A frame is constructed so that successively smaller plots are included inside the next larger plot. Close-up and general view photographs should be used with this method. The indicator of trend monitored with this method is frequency.

For further information on this method, see BLM Technical Reference (TR) 4400-4, Rangeland Monitoring Trend Studies.

Modified Line Intercept

The Modified Line Intercept method (Appendix 5) may be used for trend monitoring as an exact relocation method. Changes in basal area of perennial bunchgrasses and changes in canopy cover of shrubs and perennial forbs under a permanently established line transect will provide a determination of trend. The number of individual species under a specific line also may indicate trend. This method is limited to changes under the line and does not sample the entire plant population of the key area.

For further information on this method, see BLM TR 4400-4, Rangeland Monitoring Trend Studies.

Weight Estimate

The Weight Estimate (Double Sampling) method determines production by a process where the observer estimates the production of all species of a sample and then weighs a portion of the sample. The actual weights are then used to correct the estimates by using either a ratio technique, or statistically developing appropriate regression equations.

This method determines actual production but has some important limitations. Correction factors must be applied if any utilization has occurred and if plant growing conditions for the year of the study are not close to normal. This method is also among the more expensive methods.

The Weight Estimate method should be limited to areas where there is a special need for the type of information obtained. Weight Estimate studies are conducted in accordance with BLM Manual Section 4410.

Photo Plot or Station

The Photo Plot method includes taking a close-up photograph of a 3 x 3 foot plot and a general view photograph of the study site. Measurements and/or estimates can be made to provide quantitative data concerning vegetation characteristics. The following indicators of trend can be monitored with this method: cover, composition (by cover), reproduction and density. The Photo Plot method is conducted in accordance with BLM TR 4400-4. The Photo Station method is similar to the Photo Plot method except the 3 X 3 plot and close-up photograph are omitted.

Utilization

Utilization is the proportion or amount of the current year's production that is consumed or destroyed by animals (including insects). It may refer to a single plant species, a group of species, or to the vegetation as a whole.

Utilization data are important in evaluating the effects of grazing and browsing by livestock, wildlife and wild horses on specific areas of rangeland. Permittees, lessees and other interested parties should be consulted and encouraged to participate in the collection and use of utilization data.

There are many methods and important considerations applied in conducting utilization studies. For a thorough discussion of utilization see BLM TR 4400-3.

Acceptable methods to meet minimum standards for monitoring utilization of vegetation include, but are not limited to, the following:

Key Forage Plant

An ocular estimate is made of forage utilization within one of six utilization classes including: no use (0-5 percent), slight (6-20), light (21-40), moderate (41-60), heavy (61-80), and severe (81-100). Observations are made of the appearance of the rangeland, and especially the key species, along a transect which traverses the key area or pasture.

Documentation of Professional Judgment

Where the documentation of professional judgment is employed for utilization, it should be expressed in the same six classes as for the key forage plant method. Professional judgment can be appropriate where a low intensity of monitoring is adequate.

Both the key forage plant method and documentation of professional judgment can be recorded on utilization pattern maps and placed in allotment studies files (See BLM TR 4400-3 for detailed description of utilization pattern mapping).

Actual Use

Actual use data are important for evaluating causes of trend on specific areas of rangeland. In addition to livestock grazing use, it may also be necessary to collect or estimate data on wildlife and wild horse use. Care should be taken to distinguish between the kinds of use, particularly when they are used in allotment evaluations. Actual use data are essential in evaluations directed toward adjusting grazing use and preparing or revising management plans. Knowledge and interpretation of past use provides a basis for future management decisions. Actual use data are considered along with authorized use, estimated use, utilization, trend, climate, and any other data available or deemed necessary for allotment evaluation.

Actual use data are obtained from the livestock operators annually or at the end of specified grazing periods, but may be collected at any time during the year. Every effort must be made to obtain complete and accurate data. Actual use data contain dates, numbers and classes of livestock turned out, moved, or gathered as well as death losses. Similar records of grazing or browsing use by major wildlife species, and wild horses should be maintained where appropriate. For a thorough discussion of actual use see BLM TR 4400-2.

Climate

Weather factors, particularly amount, distribution, and timing of precipitation in arid and semi-arid areas, have a dramatic effect on vegetation productivity and must be considered when evaluating rangelands. Other weather factors such as temperature, humidity, wind, and frost also affect production, but frequently these types of data are unavailable. Crop year precipitation accounts for approximately 80 percent of the variation in vegetation production in the Great Basin.

Baseline data obtained from NOAA weather stations may be supplemented by BLM or rancher-installed and maintained stations. Permittees and lessees are encouraged to establish and maintain precipitation gauges to supplement NOAA and BLM gauges. However, supplementary gauges may not be possible. As an alternative, precipitation mapping or averaging should be used to interpret precipitation on rangelands. Several methods are available to estimate precipitation on areas where no specific data are collected. The minimum standard is the Thiessen Polygon Method as used by Sneva, F.A. & Hyder, D.N. (1962), Forecasting Range Herbage Production in Eastern Oregon, Oregon State University Agricultural Experiment Station Bulletin 588, 11 pages.

Sensitive, Threatened or Endangered Species

Threatened or Endangered Species

Federally and state listed species will be monitored annually, or as required by a "may effect" (positive or negative) determination resulting from formal consultation with the U.S. Fish and Wildlife Service (USFWS). Other documents, such as a Recovery Plan or a species specific habitat management plan, may also define BLM's monitoring responsibility.

Listed plants will be monitored using the specialized study procedures outlined in Appendix 6. These studies will be implemented in close cooperation with the USFWS, the Native Plant Society, Oregon and Washington Natural Heritage Programs and other interested parties. The Rare Plant Field Survey Form (Figure 4) will be used to document the basic plant inventory data prior to initiation of monitoring.

Currently, several listed animal species are being monitored through interagency cooperative efforts. Presently statewide bald eagle and peregrine falcon nest site occupancy and productivity surveys are being conducted through an interagency agreement at the State Office level. This broad scale monitoring effort may not satisfy site specific analysis of habitat manipulation impacts required by a district office. Therefore, additional habitat evaluation studies may be required. Monitoring of bald eagle winter roosts will continue to be the responsibility of district offices.

Monitoring of Threatened or Endangered animals must be closely coordinated with other federal and state agencies, having interest in a particular species, to avoid a duplication of efforts and possible adverse impact to that species.

Sensitive Species

Each District should maintain priority lists of sensitive plants and animals requiring monitoring consistent with budget allocations. Sensitive plants should be monitored as frequently as required to develop baseline population trend data. The plant priority list should be based on two factors: (1) the status of the plant population category; and (2) the potential of a management action to impact a plant and its habitat. Monitor sensitive plant populations as far in advance of actual project planning as possible to determine if a species may be adversely affected. See Appendix 6 for field study procedures.

Sensitive animal species should be monitored frequently enough to develop baseline population trends which could lead to, or preclude the need for federal or state listing. The intensity of monitoring should be based on the potential of management actions to impact a species and the availability of funding. The monitoring of sensitive raptor nests can often be accomplished in coordination with other activities and agencies.

Fish and Wildlife

Fish and wildlife monitoring falls into two broad categories: (1) the fish or wildlife species, and (2) their habitat. The State fish and wildlife agency has the lead responsibility for most animal species. BLM will use population data provided by the states where available. Where data are not available, cooperative surveys will be conducted (BLM Manual Section 6634, Release 6-14).

Habitat studies and monitoring involving BLM administered lands are the responsibility of the BLM. Coordination with the State fish and wildlife agency is highly desirable and strongly encouraged.

The following are minimum standards for wildlife habitat studies for Oregon and Washington:

Uplands

The Modified Cole Browse method (Appendix 7) is the minimum required. Permanent transects will be installed in big game ranges where management objectives for maintenance or enhancement of browse forage have been identified. Data will be summarized annually and analyzed with the allotment evaluation schedule.

Ecological status and trend data for habitat assessment will be gathered using the accepted Ecological Site Inventory methods on the time schedule outlined in Table 1. Comparison of data between replications will establish Ecological Trend.

Streams and Wetlands (Riparian Habitat)

Low-level aerial color photography: A photographic sample of conditions on streams and wetlands identified in the planning process for riparian management will be acquired, using either infra-red or true-color, low-level, vertical, aerial photography. Replications of these samples will be made on a time schedule not to exceed that of the trend elements of Table 1 established for the various categories of allotments (Improve, Maintain, or Custodial). Analysis of photos may be either qualitative or quantitative. Representative aerial photos should be ground truthed at selected sites. Photos of riparian vegetation from marked stations should be taken periodically.

Macroinvertebrate analysis: Macroinvertebrates have proven to be sensitive indicators of numerous habitat conditions including water presistence, water pH, water temperature extremes, turbidity, and pollutants. Macroinvertebrate sampling will be done on all streams where the objective is to maintain or improve the quality of habitat for fish and wildlife. Scheduling will be at least as often as the trend element of Table 1, as identified for the specific allotment category.

Wild Horses

Populations: Inventories must be kept current to ensure accurate actual-use records. As a minimum, aerial counts are to be conducted every other year. In years when aerial counts are not conducted, ground spot checks may be necessary to determine foal crop. Otherwise a 20 percent foal crop should be used for estimating wild horse grazing use.

Habitat: Wild horse habitat will be monitored as outlined in Table 1 standards for condition and trend.

Water Quality

Water quality monitoring will be performed to meet the objectives contained in Memorandums of Understanding with Oregon Department of Environmental Quality and Washington Department of Ecology.

The objectives of water quality monitoring are to (1) determine how well prescribed Best Management Practices (BMPs) are being implemented in field operations, (2) determine if prescribed BMPs are having the desired and expected effect on water quality, and (3) to guide the decision-making process for possible modification of management practices.

In implementing water quality studies each district will (1) complete post-project field reviews of projects where water quality or water quality associated beneficial uses were identified, and (2) monitor water quality for representative grazing management systems. The minimum water quality characteristics at each sampling station will include pH, air temperature, water temperature, turbidity, conductivity, and discharge and stage.

A minimum of 12-15 samples per station will be collected each year using standard methods. Sampling stations should be established immediately at the stream entrance and exit points of a grazing management area. These samples will be collected to represent local hydrograph characteristics. The majority of samples should be collected during periods of snowmelt and significant storm events. Additional samples may be required depending on inherent variability of water quality parameters to evaluate cause and effect relationships (BMP effectiveness).

Other Elements

There may be additional monitoring element commitments in RPSs which are not covered in this document. The responsibility for developing minimum standards for these elements will be that of the District with State Office concurrence.

ANALYSIS

The purpose of analysis is to compare all available information on a given land unit in order to determine the consequences of actions taken and to recommend a reasoned, supportable course of action for accomplishing land-use objectives. The analysis process is the final step in identifying changes needed in management. This step requires skill, knowledge, experience, training, and insight in making the proper judgments of cause and effect relationships.

Data Compilation

A major responsibility after data acquisition is the tabulation and display of all data components so that the interpreter can observe and compare changes over time. For each study, a table (Table 2) or other display will be constructed either by hand or as a computer printout to give a summary of at least three consecutive readings (when available). In some instances several components may need to be combined, tabulated, and normalized (such as actual use, utilization, and precipitation) to visually note their relationship to each other.

Interpretation

After the tables of each study's results have been prepared, it is necessary for the evaluator to interpret whether the results show a trend or have remained static over time for each type of study. The individual responsible for setting out the study and collecting the data should determine trend.

Evaluation

After studies have been completed, results tabulated, and trends indicated, the last step in the analysis process is to determine the causes of the trends and to establish a course of action for future management. Because biological systems are highly complex and variable, trends determined from various methods within a given allotment or management area may be conflicting. Therefore, a summary table (Table 3) showing trends of all studies in the area of consideration will be constructed so that relationships or conflicts may be noted.

Review Team

An interdisciplinary review team will be formed from the resource area and/or district to assist in the evaluation process. This team will consist, at a minimum, of all specialists who have established and analyzed studies within the management area. The range conservationist or an area manager appointee will conduct the team meeting. The table of trends will be available to the team. A variety of factors will be used in the evaluation and may include the following:

- Actual use
- Trend
- Photographs and sketches
- Utilization
- Precipitation
- Yield Index
- Field notes/compliance checks
- Yearly observations/reports
- Professional judgment
- Other studies
- Rancher/user group input

The team must initially consider the management objectives for a land unit and compare the observed trends to those objectives. A consensus must then be reached on whether current management is making progress in achieving the objectives, or the objectives have been achieved, based on a consideration of all available information and studies. Objectives also need to be reviewed. No single study should be used to make a recommendation for a change in course of management; all studies, including professional judgment, will have weight in the final recommendation. Decisions should be reached regarding cause and effect relationships.

The interdisciplinary team then prepares a written evaluation report to the area manager recommending any changes needed to meet management objectives. The recommendations, along with the area manager's decisions, become a part of the permanent record and are used as a basis for the RPS update. The evaluation schedule will correspond to the trend schedule in Table 1.

With slight modification, Oregon/Washington BLM endorses the courses of action for an evaluation team developed for "Minimum Monitoring Standards for BLM-Administered Rangelands in Idaho," 1984.

Determine if Management Objectives Have Been Achieved: Determine if management objectives have been achieved or adequate progress toward achieving objectives has occurred.

Management Objectives Met: If the management objectives are being met, a decision should be made on whether present management may continue or new management should be implemented.

Progress Toward Objectives is Adequate: If progress toward management objectives is adequate, the recommendation may be to continue present management.

Management Objectives Not Met or Progress Toward Achieving Objectives Not Satisfactory: If management objectives are not met and progress toward achieving them is not satisfactory, a change in management should be recommended.

Determine if Management Objectives or Monitoring Techniques Need Redefining: It may become apparent that objectives or techniques need redefining if:

Management Objectives Too Vague: Management objectives should be as clear and concise as possible.

Management Objectives Are Not Measurable: Most resource management objectives should be measurable so that evaluators know when objectives are achieved.

Management Objectives Are Unattainable or Unrealistic: Management objectives are frequently too optimistic, in terms of the goal itself and in the time period over which it is to be achieved.

Management Objectives Have Changed: Different priorities or changes in management of an allotment may indicate a need to identify new management objectives.

Monitoring Techniques Unsatisfactory: Techniques do not reflect progress relative to objectives. A recommendation may be to select new techniques.

TABLE 2

ACTUAL USE

COTTONWOOD ALLOTMENT - BLM, BEND DISTRICT

Pasture	1979	1980	1981	1982	1983	1984
Cottonwood	4/1-11/2 AUMs 6211	4/2-11/3 6266	3/26-11/5 6861	4/1-11/17 7014	4/3-12/21 6460	4/7-11/22 6446
Berry Sdg.	9/1-11/9 AUMs 617	4/3-5/24 296	4/16-6/16 380	5/1-6/12 702	5/4-7/1 706	4/2-6/21 619
Duck Creek	4/5-8/31 AUMs 530	6/16-11/14 626	6/1-11/1 746	7/15-11/2 362	8/5-11/24 788	5/12-11/15 524
Farewell Sdg.	9/1-11/17 AUMs 367	4/2-6/15 382	4/5-6/2 300	5/15-7/15 755	4/2-5/10 728	3/15-6/8 353
Lap Reservoir	4/16-8/31 AUMs 1207	7/8-11/13 769	4/17-10/25 901	6/12-11/10 1618	7/1-11/25 1502	6/22-11/16 1464
Lap Seeding	9/22-11/17 AUMs 329	4/2-6/16 101	4/4-6/1 216	4/1-5/15 574	6/10-8/6 433	4/2-5/11 248
Mile Springs	4/2-9/25 AUMs 1567	5/24-11/15 1159	4/3-11/2 2222	7/15-10/26 1284	4/4-11/26 1779	4/12-12/14 2341
Rail Canyon	4/8-4/16 AUMs 52	4/1-7/7 551	4/1-4/16 551	4/1-5/5 310	4/2-5/5 326	4/1-6/23 448

TABLE 3

TRENDS

COTTONWOOD ALLOTMENT

Pasture	Management Objective	Carrying Capacity - 7 yrs. Data-Based on A.U./Util./Precip.	Upland Trend - Frequency	Professional Judgment	Photo Evaluation
Cottonwood	Improve Ecosite Condition	Static to Down	Up, Down, Static	Static	Up, Down, Static
Berry Sdg.	Widlife Habitat Management	Down	Down	Static	Static to Down
Duck Creek	Improve Ecosite Condition	Down	Down	Static to Down	Down
Farewell Sdg.	Wildlife Habitat	Static to Down	Down	Static to Down	Static to Down
Lap Reservoir	Improve Ecosite Condition	Static	Static	Static to Up	Static
Lap Seeding	Wildlife Habitat Management	Down	Down	Static	Static
Mile Springs	Improve Ecosite Condition	Static	Up	Static to Up	Static to Up
Rail Canyon	Improve Ecosite Condition	Up	Static	Up	Static to Up

COTTONWOOD ALLOTMENT - SUMMARY OF AUMs

Licensed Use = 12,594 AUMs

Actual Use = 12,831 AUMs (1984)

Carrying Capacity Based on [illegible]./Util./Precip. = 11,232 AUMs

DOCUMENTATION

Record Keeping

Because a significant amount of funding and time has been and will be expended for collecting monitoring study data, each field office will have a plan for filing, storing, and retaining the data collected. In addition, the plan should provide for recording the location and description of the specific study sites. Monitoring study data collected over a period of years will be important for resource management in the future. Where studies are discontinued, the data and the record of study locations should be retained indefinitely.

It is recommended that the format in Illustration 1 be used. This would provide for a two-way file that would contain the basic data as well as a summary for each monitoring element.

An annual allotment summary will be written for all Category I allotments, should be written for Category M allotments, and may be written on Category C allotments. The purpose of this summary is to document professional observations and judgment, to supplement more intensive studies, and to document information that may not be recorded elsewhere such as reports by other specialists, visits with ranchers, observations on plant vigor, litter accumulations, regrowth, erosion, wildlife, wild fires, and other factors.

Reporting

Field offices will submit reports as required on conditions and trends. Records and files should be organized and maintained in a manner that will facilitate making reports on the following:

-Ecological Status and Ecological Trend (Appendix 1) will be reported separately for riparian areas and uplands. Uplands will be reported in acres. Riparian areas will be reported in acres and stream miles.

-Range Condition and Range Trend (Appendix 1) will be reported in acres for both uplands and riparian areas.

Appendix 1

Rangeland Classification

The following definitions provide the basis for rangeland classification:

An Ecological Site is a distinctive kind of land that differs from other kinds of land in its ability to produce a characteristic natural plant community. An ecological site is the product of all the environmental factors responsible for its development. It is capable of supporting a natural plant community typified by an association of plants that differs from that of other ecological sites in the kind or proportion of plants, or in total production.

The Potential Natural Community is the biotic community that would become established if all successional sequences were completed without interference by man under the present environmental conditions It includes the total plant community that is best adapted to the unique combination of environmental factors and is in dynamic equilibrium with the environment. Such natural disturbances as drought, wild fires, grazing by native fauna, and insects are inherent in the development of any natural plant community. Plant communities that are protected from these natural influences for long periods do not always typify the PNC.

Ecological Status (Natural Vegetation) is the present state of vegetation of an ecological site in relation to the potential natural community (PNC) for the site. Ecological Status is expressed as Seral Stages based on the kind, proportion, and amount of plants in the present community relative to the PNC as follows:

Percent of Present Plant Community that is PNC for the Ecological Site	Ecological Status
76 - 100	PNC
51 - 75	Late Seral
26 - 50	Mid Seral
0 - 25	Early Seral
Unclassified	Unclassified

Seeding Status (Revegetation) is the present state of vegetation of a rangeland seeding in relation to the physiological and structural equivalent of the potential natural community (PNC). The procedure for rating Seeding Status assumes that the intentionally introduced plants occupy specific ecological niches that could otherwise be occupied by plants naturally occuring in the PNC. Therefore, Seeding Status can be expressed as Seral Stage Equivalents based on the kind, proportion, and amount of plants in the present community relative to the PNC, plus the proportion and amounts of intentionally introduced plants as follows:

Percent of Present Plant Community that is PNC for the Ecological Site, Plus Percent of Present Plant Community that is Intentionally Introduced	Seeding Status
76 - 100	PNC Equivalent
51 - 75	Late Seral Equivalent
26 - 50	Mid Seral Equivalent
0 - 25	Early Seral Equivalent
Unclassified	Unclassified

Ecological Trend is the direction of movement relative to the PNC. Ecological Trend is expressed as "Toward" if movement is toward the PNC or PNC Equivalent, "Not Apparent" if there is no apparent movement, "Away" if movement is away from the PNC or PNC equivalent or "Unclassified" if trend has not been determined.

Resource Value Rating (RVR) is the value of vegetation of an ecological site for a particular use or benefit. RVR's may be established for each plant community, Seral Stage, or Seral Stage Equivalent capable of existing on an ecological site, including exotic or cultivated plants. RVRs may be expressed in quantitative terms such as acres per AUM, deer per square mile, tons of sediment per acre per year; qualitative terms such as satisfactory, marginal, unsatisfactory; or relative terms such as worst, better, best. The primary utility of RVR's is that of providing a tool for identifying, organizing, and displaying potentials and options for a variety of uses during the process of establishing objectives in the land-use planning process.

Range Condition (PRIA) is the relationship of the Ecological Status represented by the present plant community on a given unit of rangeland to the Ecological Status that would best satisfy range management objectives determined in the land-use planning process for that unit of rangeland. Range Condition Classes are based upon the number of Seral Stages (or Seral Stage Equivalents) of departure from the desired Ecological Status (or Seeding Status) as follows:

Seral Stages (or Equivalent) of Departure	Range Condition Class
None (presently meeting objective)	Good
1 seral stage of departure	Fair
2 seral stages of departure	Poor
3 seral stages of departure	Bad
Unclassified	Unclassified

Range Trend is the direction of movement relative to range management objectives. Range Trend is expressed as "Up" if movement is toward objectives, "Not Apparent" if there is no apparent movement, "Down" if movement is away from objectives, and "Unclassified" if trend has not been determined.

These concepts of rangeland classification are used in the following manner:

An Ecological Site Inventory (ESI) produces an inventory of the present vegetation (Ecological Status) on the land and the land's natural potential for producing vegetation (Ecological Sites). Evaluation of the inventory data and application of ecological principles allows each Seral Stage of each Ecological Site to be characterized in terms of the kind of plant community the Seral Stage would represent.

Where the ESI has included a substantial amount of sampling, tables can be constructed that show Seral Stage characteristics in considerable detail (Tables 4 and 5). Where this level of sampling has not been done, a less specific characterization can be done in narrative form (Table 6).

After the Seral Stages have been characterized, Resource Value Ratings can be developed. Based on the Seral Stage characteristics, resource specialists or an interdisciplinary team evaluates each Seral Stage for each important use in the resource area. When RVRs are displayed in tabular form (Table 7) for an ecological site, they facilitate the evaluation of options during land-use planning. For example: If Table 7 represented an area where the greatest known needs were for antelope fawning and grazing season-long by cattle, then the Late Seral plant community would be optimum.

However, if spring range for mule deer was the greatest need and water quality was not a major consideration for the area, then Mid Seral would be optimum.

The RVR process differs from previous land-use planning concepts only in degree of specificity and documentation within a framework of classification. Resource Value Ratings document and classify what has usually been mostly a mental process. This conceptual compatibility with previous land-use planning will facilitate phasing over to the RVR base as additional areas are covered by the Ecological Site Inventory.

By using the RVR process, it becomes possible to state range management objectives in terms of desired Ecological Status. This is a very important feature because range management objectives provide the basis for monitoring Range Condition as required by the PRIA. Because the RVR process ties range management objectives to Ecological Status, Range Condition and Range Trend become interpretations of Ecological Status and Ecological Trend. Therefore, Range Condition and Range Trend do not require additional inventory or monitoring. Furthermore, the RVR process insures that range management objectives are multiple-use objectives. This substantially reduces the need to inventory or monitor for individual uses.

The interrelationships of Ecological Status, Ecological Trend, range management objectives, Range Condition and Range Trend are shown on table 8. This type of database is ideally suited to Automated Data Processing.

Table 4

Example of Tabular Characterization of Seral Stage for an Ecological Site

Species	Early Seral	Mid Seral	Late Seral	PNC
bluebunch wheatgrass	0-10%	10-44%	44-71%	71-79%
Sandberg's bluegrass	3-7%	7-10%	10-14%	14-15%
other perennial grasses	3-5%	5%	2-5%	0-1%
cheatgrass	10-13%	6-8%	2-6%	0-2%
other annual grasses	1-2%	0-1%	0%	0%
forbs	4-8%	6-8%	4-6%	2-4%
big sagebrush	55-70%	26-55%	5-26%	0-5%
other shrubs	4-5%	3-4%	2-3%	2%
number of grasses 1/	6-7	5-6	5	3-5
number of forbs 1/	4-6	4-6	4	2-4
number of shrubs 1/	4	3-4	2-4	2-3

Table 5

Example of Tabular Characterization of Seral Stage Equivalents for an Ecological Site that has been Revegetated.

Species	Early Seral Equivalent	Mid Seral Equivalent	Late Seral Equivalent	PNC Equivalent
crested wheatgrass	0-4%	4-33%	33-58%	58-78%
Sandberg's bluegrass	0-2%	2-6%	6-9%	9-13%
other perennial grasses	8-9%	7-8%	4-7%	2-4%
cheatgrass	21-24%	12-21%	5-12%	0-5%
forbs	6-7%	6-8%	5-8%	3-5%
big sagebrush	45-47%	24-45%	14-24%	4-14%
other shrubs	13-14%	10-14%	5-10%	0-5%
number of grasses 1/	7-8	8	7-8	5-7
number of forbs 1/	7-9	7-8	5-8	4-5
number of shrubs 1/	2-4	3-4	2-4	2

1/ Number of species that are one percent or more of the composition.

Table 6

Example of narrative characterization of Seral Stages for an Ecological Site.

PNC - The PNC for this Ecological Site has the appearance of a grassland with a modest component of shrubs and a sparse scattering of forbs. Bluebunch wheatgrass strongly dominates the grass component with Sandberg's bluegrass making up most of the remainder. The shrubs are mostly big sagebrush.

Late Seral - The general appearance of this Seral Stage is that of an open shrubland with a strong herbaceous component. Bluebunch wheatgrass remains strongly dominant over Sandberg's bluegrass and big sagebrush remains the dominant shrub. This Seral Stage may have a somewhat greater component of forbs than PNC.

Mid Seral - The general appearance of this Seral Stage is that of a moderate to dense shrubland with a moderate understory of grasses. The amount of bluebunch wheatgrass generally equals or exceeds the aggregate amount of other grasses, mostly Sandberg's bluegrass and cheatgrass. Most of the shrubs are big sagebrush. Forbs are about twice as plentiful as in the PNC.

Early Seral - This seral stage is characterized by a dense stand of big sagebrush with a sparse understory of cheatgrass, Sandberg's bluegrass, and forbs.

Table 7

Examples of Resource Value Ratings

Use	Early Seral	Mid Seral	Late Seral	PNC
cattle season-long	Poor	Fair	Good	Excellent
water quality	Unsatis.	Marginal	Satis.	Satis.
mule deer spring	Fair	Good	Fair	Poor
antelope fawning	Unsuitable	Suitable	Suitable	Unsuitable
wildlife diversity	3	1 (best)	2	4 (worst)

Table 8

Example of a Condition and Trend Database

Land Unit	Acres	Ecological Status	Ecological Trend	Range Management Objective	Range 1/ Condition	Range 1/ Trend
A101	600	Mid Seral	Toward	Mid Seral	Good	Down
A102	530	Mid Seral	Toward	Late Seral	Fair	Up
A103	94	Late Seral	Away	Mid Seral	Fair	Up
B530	1043	Early Seral	Not App.	Late Seral	Poor	Not App.
B560	345	PNC	Away	Early Seral	Bad	Up
C430	462	Early Seral	Toward	PNC	Bad	Up
C452	1835	Mid Seral	Not App.	Mid Seral	Good	Not App.
C620	2437	Mid Seral Equivalent	Toward	PNC Equivalent	Poor	Up

1/ Interpreted from Ecological Status and Ecological Trend relative to Range Management Objective.

Appendix 2

OBSERVED APPARENT TREND*

Indicators of observed apparent trend have been divided into two groups, one indicating downward trend and the other indicating upward trend. The indicators are further classified into indicators of soil trend and indicators of trend in vegetation. It is not safe to base conclusions with reference to trend on one or two indicators unless they are especially strong. If a majority of indicators point to improvement, the apparent trend should be judged as being up; if a majority point to deterioration, the apparent trend should be judged as being down. If apparent trend cannot be determined, the situation should be judged as not apparent.

SOIL INDICATORS OF DOWNWARD TREND

Rill Marks. Rill marks are small active gullies, frequently of the shoestring type. They often appear during storms but may be obliterated later, depending on depth of cutting.

Active Gullies. These are established gullies that are raw and actively cutting. This type of gully may vary from a few inches to several feet in depth.

Alluvial Deposits. These are soil material transported and laid down by running water. Soil deposits may be found in depressions, behind piles of litter or debris, or at the termination of rills and gullies. Recent deposits may partially cover the basal portions of established plants. They may be distinguished from old ones by the absence of perennial vegetation on the deposit.

Soil Remnants. Soil remnants are portions of the original topsoil held in place by vegetation or plant roots. They may form the base of pedestaled plants. Soil pedestals carved by rocks or pebbles are usually of recent origin following storms. Steep-sided soil remnants indicate soil instability and a downward trend. Almost vertical sides are characteristic, often with exposed roots of the plants holding remnants of the soil.

Active Terraces. Active terraces are "stairstep-like" in appearance on slopes. They are produced by an accumulation of soil above clumps of vegetation and by the removal of soil from the clumps below. Terraces are usually caused by the hooves of animals. Active terraces have steep sides, show evidence of sliding soil, exposed live roots, and are not stabilized by vegetation.

---

* Adapted from Forest Service Region Four "Range Analysis Handbook" July 1964.

Exposed Plant Crowns or Roots. This is soil loss taking place currently as shown by exposed crowns or roots appearing on young, deep-rooted perennial plants.

Wind-Scoured Depressions Between Plants. Wind removal of soil particles causes depressions in the surface of the soil. In extreme cases, the soil surface is merely a series of shallow depressions separated by low ridges of vegetation. If the surface of the depression is scoured or etched, rapid downward trend is indicated.

Wind Deposits. Wind deposits are formed by fine soil particles that have drifted onto the lee side of vegetation or into the vegetation itself. Recent wind deposits show little, if any, discoloration of the surface material by organic matter and no decomposition of buried parts.

SOIL INDICATORS OF UPWARD TREND

Gullies Healed. These are gullies which originate on the area and are stabilized by the growth of perennial vegetation on both sides and bottom. The sidewalls will be rounded in appearance. The presence of vegetation in gully bottoms is not in itself a reliable indicator of improved condition. It may be highly misleading if used without a careful appraisal of conditions on the area drained.

Sloping-Sided Soil Remnants. These are soil remnants with sloping sides, or sides clothed with mosses, lichens, or higher plants. Plant roots are covered by soil. Space between soil remnants are being occupied by perennial plants.

Healed Terraces. Stabilized terraces are characterized by sloping sides clothed with vegetation and no exposed live roots. Tops of terraces are invaded and occupied by perennial plants.

PLANT INDICATORS OF DOWNWARD TREND

Better Forage Plants Unavailable to Livestock. Dead and dying hedged plants present. Dead branches generally indicate that shrub is dying.

Hedged and Highlined Shrubs. Dead and dying hedged plants present. Dead branches generally indicate that shrub is dying.

Lack of Reproduction and Young Plants of Better Species. Absence of seedlings or young plants of both palatable and unpalatable plant species may indicate that the microclimate is unfavorable for germination or seedling survival. If seedlings and young age classes of unpalatable plants are present and those of palatable plants are absent, it may be assumed that grazing is too severe for palatable plants to become established. Down trend is indicated.

Invasion by Unpalatable Plants. Invasion by unpalatable or poor forage plants is an indicator of downward trend in forage value.

Palatable Plants Lacking in Vigor. Low vigor in plants is shown by the pale, sickly color of foliage, few seed stalks produced by grasses, shallow or scant root systems of normally deep-rooted plants, and absence of seedlings.

Scarcity of Litter of Palatable Plants. Litter scarce and poorly dispersed.

PLANT INDICATORS OF UPWARD TREND

Better Forage Plants Invading and Readily Available to Livestock. Better forage plants growing in the openings between shrubs.

Invasion of Bare Spots by Better Forage Plants. Invasion must be positive, that is, a variety of age classes must be represented in addition to seedling reproduction. Better forage plants should be invading in stands of unpalatable plants or on bare ground lacking vegetation. Invasion by perennials into openings between shrubs is a good indicator of upward trend.

Invasion on Erosion Pavement. Invasion and establishment of perennial plants on erosion pavement is a good indication of upward trend. The basal parts of invading plants will be flush with the ground surface if soil erosion has stopped.

Several Years' Growth from Hedged Browse. At least two or more years' regrowth is readily established by a count of annual growth rings.

Palatable Plants Vigorous. Grasses robust with many leaves, seed stalks tall and numerous, leaves a healthy green color. Forage plants reproducing vigorously with a variety of age classes present.

A Well-Dispersed Accumulation of Litter from Past Years' Growth. Generally, a well-dispersed layer of litter accompanies a well-dispersed vegetal cover.

USDA Forest Service

APPARENT TREND RATING
(FSH 2209.21, 2.23f)

FOREST ____________ DISTRICT ____________ ALLOTMENT ____________

Study Type: Study Name/Number ____________

Site Analysis ☐ By ____________ Date ____________

Trend Study ☐ By ____________ Date ____________

VEGETATION

Up or Stable		Down	
1. Favorable frequency grouping and age classes of desirables, intermediates, and least desirables.	____	1. A disproportionate amount of intermediates and least desirables. Seedlings of better plants having difficulty in becoming established.	____
2. Forage plants not being pulled up or trampled out by grazing.	____	2. Forage species being pulled up and trampled out by grazing.	____
3. Vigor of key species high as indicated by leaf length, seed stock production, and normal color.	____	3. Low vigor of key species as indicated by reduced size of plant, reduced leaf length, lack of seed stalks, and off color (sickly yellow).	____
4. Browse species showing little or no hedging.	____	4. Browse species showing heavy hedging.	____

SOIL

Up or Stable		Down	
1. Ground cover dispersion - uniform.	____	1. Ground cover dispersion - variable to highly variable.	____
2. No detectable soil movement.	____	2. Soil movement detectable.	____
3. Soil cover continuous and intact.	____	3. Soil Cover broken and soil exposed.	____
4. No exposure of plant roots.	____	4. Plant roots exposed. 1/	____
5. Stones and rock fragments where present, normal, and in place - no movement of rock fragments.	____	5. Stones and rock fragments, where present, concentrating on surface as erosion pavement. Fragments loose and often moving downslope.	____
6. Lichen lines on stones and rock fragments extend to soil level.	____	6. Lichen lines on stones considerably above soil surface - no lichens on rock fragments.	____
7. No active gullies.	____	7. Active gullies - indicated by recent cutting and sloughing.	____
8. No recent soil deposits either alluvial or aeolian.	____	8. Recent soil deposits - alluvial or aeolian.	____
9. No wind-scoured depressions.	____	9. Wind-scoured depressions.	____

1/ At high elevations and on heavy soils some of this may be natural due to frost heaving.

Appendix 3

NEAREST PLANT METHOD

Establish the pace transect route between two described points. Go ten paces along the route, and then start recording at every pace, or other interval, the nearest plant within the 180° arc from the center of the front of boot or shoe. Maintain the constant transect direction by frequently referring to the direction marker (see example of "layout" on Figure 1).

Record perennial species only, excluding seedlings. You may want to select only a few species, such as four grass species, three forbs, and three shrubs. If other species are nearest, they may be recorded as other grass, other forbs, or other shrubs. Or you may just record the nearest plant of the species you have selected (Figure 2 shows a form example). Describe how you decided to conduct the transect so it is repeated as close as possible to the original.

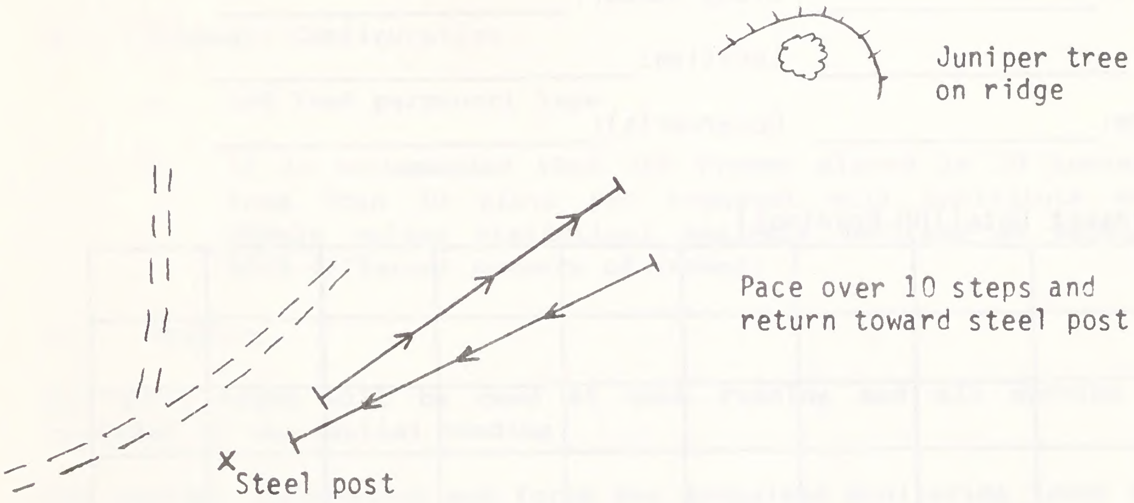
A "direct hit" with the center of the foot is simply the "nearest plant". For consistent recording, if a hit occurs for both a shrub and a grass, the grass hit will prevail. Refer to Figure 1 for diagrams on determining nearest plant.

Figure 1

Bureau of Land Management OR/WA

NEAREST PLANT METHOD

A) Layout Example:



B) Determination of a hit, or nearest plant:

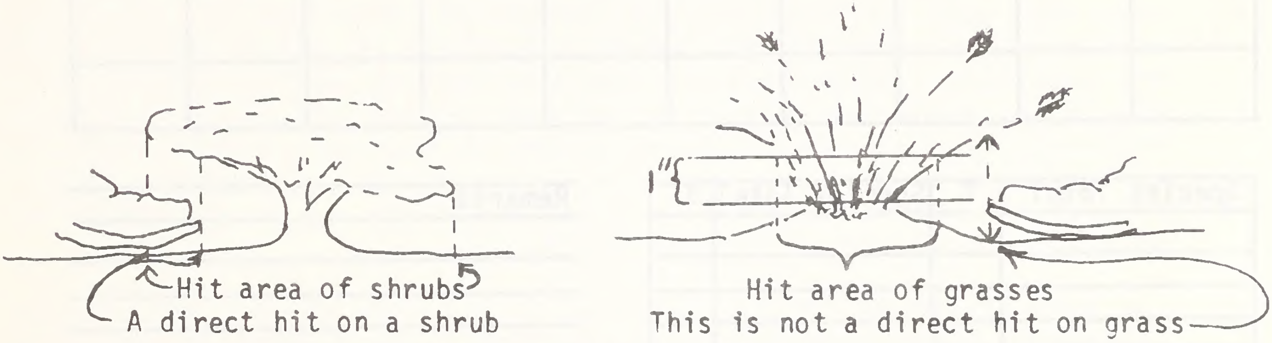


Figure 2

Bureau of Land Management OR/WA

NEAREST PLANT METHOD

District: ____________ Resource Area: ____________ Date: ____________

Allotment: ____________ Study Number: ____________

Pasture: ____________ Location: ____________

Veg. Type: ____________ Observer(s): ____________

Pace Transect Data (100 Readings)

Species Total	%	Species Total	%
		Totals 100	100

Remarks ____________

Appendix 4

Nested Frequency Method

All new frequency studies in Oregon/Washington will include the following guidelines:

1. Plot Size - Plots will be 10 x 10 cm, 25 x 25 cm, 50 x 50 cm, or a multiple thereof for larger frames.

2. Transect Configuration

   a. 100 foot permanent tape

   b. It is recommended that 200 frames placed in 20 transects of no less than 10 plots per transect will constitute an adequate sample unless statistical analysis verifies an adequate sample with different numbers of frames;

3. Reading

All plot sizes will be read at each reading and all species should be recorded at the initial reading.

For further information and forms see Rangeland Monitoring Trend Studies-BLM TR 4400-4.

Appendix 5

MODIFIED LINE INTERCEPT

The modified line intercept method measures the basal area of perennial grasses and the canopy cover of shrubs, trees, and perennial forbs. Because sampling the entire population of a key area would require a large number of samples, this technique for trend determination should be considered an exact relocation study. The increase or decrease in size and number of individual species under a specific line constitutes a determination of trend for that key area.

At each study site, at least two permanent 50 foot line transects will be established and permanently marked. Two lines permit stretching the tape tighter than would a single 100 foot line. Horizontal, linear measurements are then made by recording the lengths of the intercepts of plants along the tape. Measurements are read to the nearest 1/100 foot. The following may be measured: 1) perennial bunchgrasses - basal area, 2) perennial and biennial forbs - canopy cover, 3) rosette form perennial and biennial forbs - basal area, and 4) shrubs and trees - canopy cover.

Guidelines for Reading the Line Intercept Study

To attain a reasonable degree of consistency between individuals and from time to time, the following standardizations are necessary when laying out and reading the modified line intercept study.

(1) A diagram should be drawn on the initial data collections form, or on the plot location form, indicating the numbered ends of the tape (No. 0 and No. 100) and the general plot layout, so that on subsequent readings the tape may be placed in exactly the same position with the No. 0 and No. 100 spots remaining constant.

(2) When the tape is laid out, it should be stretched as tight, as straight, and as low to the ground as possible to assure relocation on the same line. When threading the line through shrubs, special care should be taken to threat it as low to the ground as possible. Additional markers may be placed at the 25 foot and 75 foot marks, or at strategic locations near or in shrubs, to assure proper relocation. The additional markers and their locations should be noted on the diagram of the plot layout.

(3) The line should be read by standing to the side of the tape without tic marks and by reading the horizontal linear length of the plant intercepts along the side of the lines with tic marks which indicate 100ths, 10ths, and foot measurements. Only what falls directly under the marked edge of the tape should be read as intercepted plant material. It is important to be aware that reading plant intercepts obliquely rather than straight down would influence comparative results from time to time. Small pointers held along the edge of the line may be useful in determining exact intercepts.

(4) Perennial grasses, grass-like plants and rosette forming plants are measured at the ground level (basal measurement). Only live material is measured. Dead centers of bunchgrasses should be omitted. If a dead portion of a center measures more than one-half inch, it should not be recorded as live crown cover. For perennial forbs, shrubs, and trees, a vertical projection of the canopy intercepting the tape should be made. Where gaps occur within an individual shrub, record only intercepts of the shrub canopy. The intercept of any grasses and forbs occurring under shrubs also should be measured and recorded.

(5) When intercepts are read late in the season and residue of perennial forbs lies under the tape, their intercept should be read as if they were live material.

(6) Baseline data should be recorded on a data form which pictorially represents the 100 foot line (see Figure 3). Intercepts should be graphically displayed for all perennial key species as a minimum.
The exact length of each intercept should be determined at the time of reading each intercept and written beside the species symbol.

(7) A small plumb bob has proven useful for determining precise intercepts. If a plumb bob is used, a note should be added to that effect on the data sheet so that the plumb bob will be used on subsequent visits.

Figure 3

LINE INTERCEPT STUDY

Allotment ____________________

Pasture ____________________

Plot # ____________________

Date ____________________

Examiner ____________________

Photo ____________________

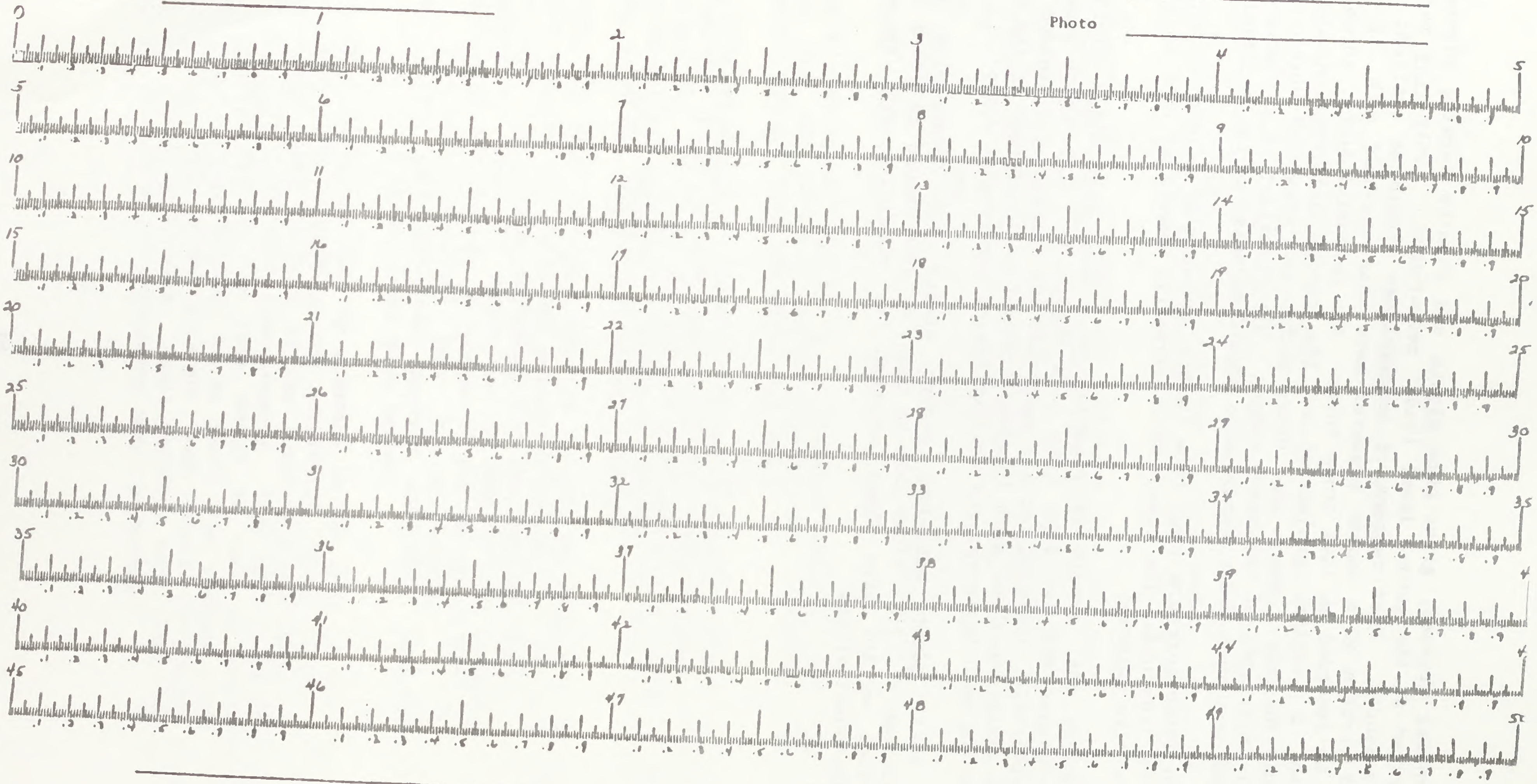
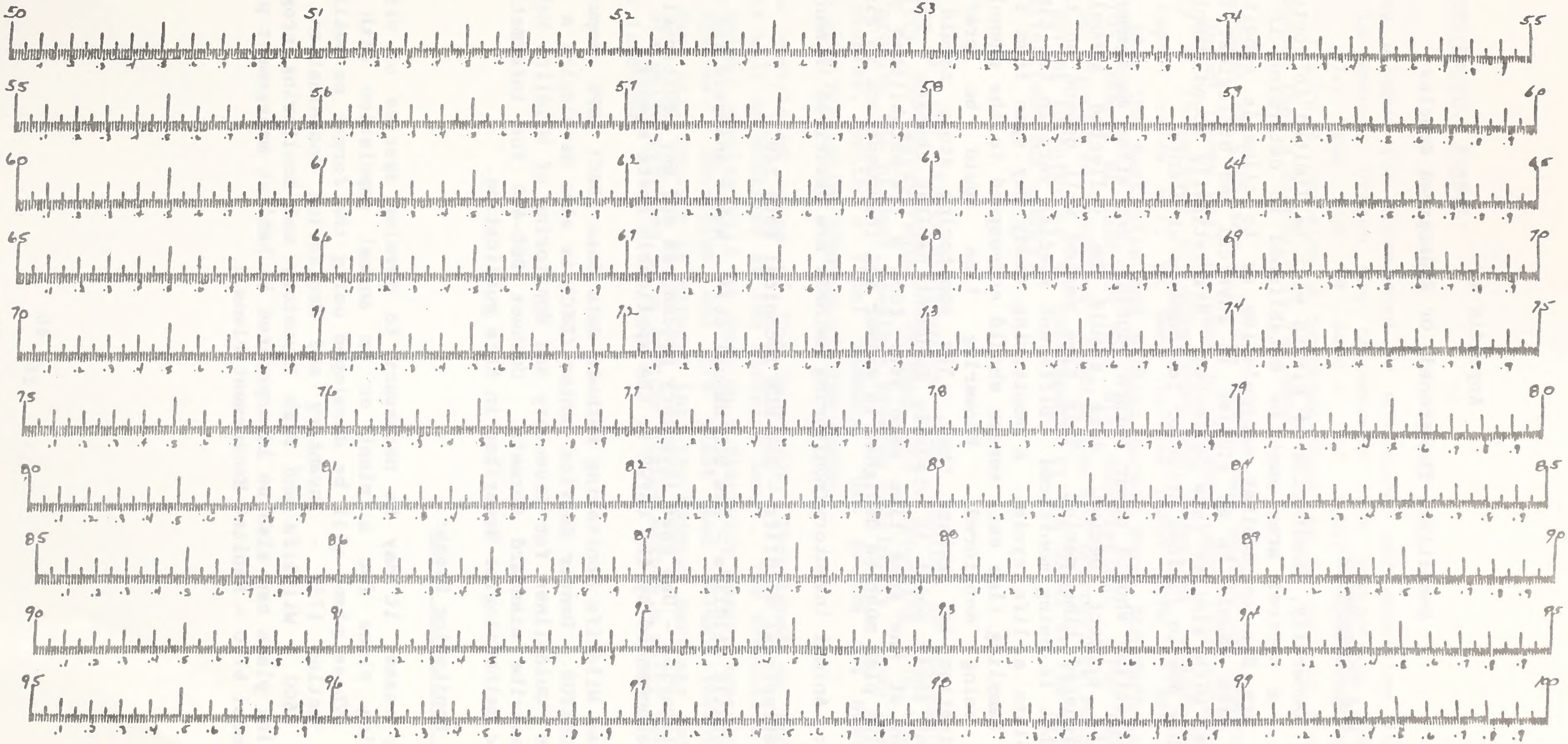


Figure 3 (Cont.)

Allot. ____________ ____

Past. ____________ ____



Species ________ **% Cover** ________ **Species** ________ **% Cover** ________ **Species** ________ **% Cover** ________

Appendix 6

Sensitive, Threatened, Or Endangered Species

Methods and Procedures:

Plants: Generally, monitoring of plants will be limited to controlled case studies. A control area must be established to determine if population changes are due to habitat manipulation or to climatic conditions. The control area should be as similar in physical and biological features as possible, with similar data collected. Statistically sound sampling may be impossible due to limited sites or low numbers of plants.

Data collection should occur before, during, and after management actions. Once the project begins, data should be collected annually for a pre-designated time period. This time period will depend on the type of plant that is being monitored. Different species vary in the time it takes to complete a life cycle. A monitoring study may span from five to ten years. Sampling time each season should correspond to the phenology of the plants being monitored. Flowering time would be preferable as identification is easiest then. The monitoring study should include a permanent photo point to visually document habitat changes. Photos should be taken at the same time each year from a pre-established point. The monitoring plan must be designed to answer all the questions in Figure 5.

Animals: Animal inventory/monitoring methods are described in many sources:

Terrestrial Wildlife - See BLM Technical Note 349.

Aquatic Wildlife - See BLM Manual 6674 - Water Analysis for Fisheries.

Fisheries - Use past inventory procedures and any additional methods recommended by the USFWS or the applicable state agency.

Also, see Wildlife Monitoring Methods Data Base (DSC) ASPN computer program WLMON/MONITOR. Denver Service Center (DSC) is also developing a publication entitled "Guidelines for Inventory and Monitoring of Wildlife Habitat" that will describe standard formats. Contact DSC-470 for information on the specific methodologies described in this publication.

Special Monitoring Plans:

In many cases, it may be necessary to develop species or site specific monitoring plans for a plant or an animal population with restricted ranges. These plans will be developed using the format as outlined in BLM Manual Section 1737 - Inventory and Monitoring Coordination and Manual Section 6600 - Wildlife and Fish Inventory and Monitoring programs. The monitoring plans can also be incorporated in habitat management plans (HMPs) (see Manual 6780 - Habitat Management Plans).

Study Methods/Reports Format:

Two sampling schemes for threatened or endangered and sensitive plants on BLM lands in western Oregon are recommended (see Instruction Memorandum OR-85-424). Also see BLM TR 4400-4 for other vegetation sampling techniques. Figure 6 contains a tracking sheet to be used in monitoring plants to ensure that a schedule is followed.

Oregon Department of Fish and Wildlife (ODFW) and Washington Department of Game (WDG) Report Cards will be used to document nest site occupancy and productivity of threatened or endangered and sensitive nongame species. Completed report cards will be sent to the local ODFW or WDG nongame biologist. Also the Nest Site and Habitat Survey Form, BLM Technical Note 349, page 105, should be used for nest site descriptions. For sensitive, threatened or endangered fisheries, studies use the appropriate methods and forms used during inventories, or recommended by the USFWS or the applicable state wildlife/fisheries agency.

Evaluation:

One person in the district/resource area should be delegated the responsibility for establishing, reading and evaluating the monitoring results to provide the highest possible program continuity. Upon completion of field studies, write a final summary. Use graphs and photographs (plants) to show population changes if they occur.

Due to the restricted range of the Sensitive, Threatened or Endangered plants, data will be analyzed at the District level. The evaluation of data for mobile animal species will be done on a Statewide basis, especially for raptorial species. Sensitive and T/E plant and animal inventory or monitoring data will usually be entered into the Natural Heritage Data Bases to provide statewide profiles on a species status across a major portion of the state's landbase.

Figure 4

BLM OREGON STATE OFFICE PORTLAND, OREGON

RARE PLANT FIELD SURVEY FORM

PLEASE COMPLETE ALL ENTRIES IN THE BASIC DATA SECTION ABOVE THE HEAVY LINE. IF YOU HAVE TIME, WE WOULD APPRECIATE YOUR ENTERING ALL INFORMATION NOW AVAILABLE TO YOU WITHIN THE DETAILED SECTION BELOW THE HEAVY LINE. YOU DO NOT HAVE TO COMPLETE ALL ENTRIES IN THE DETAILED SECTION. YOU MAY USE THE BACK FOR COMMENTS.

BASIC DATA

SCIENTIFIC NAME: ____________________

Date of Field Work: ____________ (day mo. year) County: ____________ Collection: Date: ________ (#________)

Directions: ____________________ Collector: ____________

____________________ Repository: ____________

____

Reporter: ____________________ Phone ____________

DISTRICT: ____________________

DETAILED INFORMATION

1. LOCATION

A. Is this a new location record? _____ Yes _____ No _____ Unknown. Is this a subsequent visit? _____ Yes _____ No

B. Plant found? _____ Yes _____ No If not, reason: ____________________

C. Location: T _____ R _____ _____ ¼ of _____ ¼ Sec. _____ - T _____ R _____ _____ ¼ of _____ ¼ Sec. _____

D. Owner (Name/Address/Phone): ____________________

____

E. Attach, or sketch on back, a map indicating the exact site, scale, and proximity to a prominent feature.

2. SPECIES BIOLOGY (Check one or more, and fill in percentages)

A. Phenology
- _____ in leaf
- _____ in bud
- _____ in flower
- _____ in fruit
- _____ Fall regreen
- _____ Dormant

B. Number of Plants
- _____ 1-10
- _____ 11-50
- _____ 51-100
- _____ 101-1000
- _____ 1001-10,000
- _____ 10,001 +

C. Population Area
- _____ <1 m² (=yd²)
- _____ 1-5 m²
- _____ 5-10 m²
- _____ 10-100 m²
- _____ 100 m² - 1 ha
- _____ 1 ha + (=2½ ac)

D. Age Class
- _____ % Seedlings
- _____ % Immature
- _____ % 1st yr
- _____ % Mature
- _____ % Senescent
- _____ % _____

E. Compared to your last visit to this site: Number of Plants ___ more ___ same ___ fewer Population Area ___ larger ___ same ___ smaller Age classes ___ same ___ different

F. Give reasons for changes: ____________________

____

3. HABITAT (Describe site and check one or more, or fill in blanks)

A. Plant Communities/Habitat Description ____________________

____

____

B. Aspect
- _____ N
- _____ E
- _____ S
- _____ W
- _____ Flat

C. Slope
- _____ Slight, 0°- 20°
- _____ Moderate, 20°- 45°
- _____ Extreme, 45°+
- _____ Vertical

D. Topographic Position
- _____ Crest
- _____ Upper Slope
- _____ Mid-Slope
- _____ Lower Slope
- _____ Bottom

E. Light
- _____ Open
- _____ Filtered
- _____ Shade

F. Moisture
- _____ Inundated
- _____ Saturated
- _____ Moist
- _____ Dry

G. Elevation: __________ ft (m) to __________ ft (m).

H. Substrate/Soils: ____________________

I. Associated Species : CANOPY SHRUB HERBS

Taxa of the same Genus: __________ __________ __________

__________ __________ __________ __________

J. Disturbances/Visible Threats: __________ __________ __________

4. DETERMINATION (Check one or more, fill in blanks)

A. How was plant identified?
- _____ Keyed in a Flora (title ____________________)
- _____ Compared with Specimen ____________________)
- _____ Compared with Photo/Drawing (source ____________________)
- _____ By another person (name ____________________)
- _____ Other (____________________)

5. PHOTOGRAPHS (Check one or more)

A. Subject
- _____ Plant
- _____ Habitat
- _____ Diagnostic Feature
- _____ Other

B. Type
- _____ Slide
- _____ Print

C. May we obtain duplicates at our cost? _____ Yes _____ No

6. OTHER KNOWLEDGEABLE INDIVIDUALS (Name/Address/Phone)

Figure 5

Data Measurements

1. Survival number

2. Per cent increase/decrease of population.

3. Species biology

    a. Phenology (vegetative, budding, flowering, fruiting, seed dispersal, dormant).

    b. Age Class (% seedlings, immature, first year, mature, senescent).

    c. Vitality/Vigor (vigorous, normal, feeble, never fruiting, unable to determine).

4. Associated Species (composition change).

5. Canopy change.

6. Management actions which have occurred since monitoring began (harvest, burn, rip, etc.).

7. Climatic conditions (general late spring, dry year, wet year - exact if possible).

8. Additional observations.

Figure 6

Tracking Sheet for Monitoring Plants

Species to be monitored: ____________________ ____________________.

Timber sale in which species occurs ________________________________.

Resource Area ______________________. Legal T R S

Inventory date ____________________

Monitoring study developed 19__. By _______________ _______________.

Photopoint and data collection before impact. ____________________, 19__.

Timber harvest occurred ________________ ________________.

Photopoint and data collection ____________________, 19__.

Silviculture practices:

Burn: ________________, 19__.
Rip: ________________, 19__.
Spray: ________________, 19__.
Fertilize: ________________, 19__.

1. Photopoint and Data Collection ________________, 19__ By __________
2. Photopoint and Data Collection ________________, 19__ By __________
3. Photopoint and Data Collection ________________, 19__ By __________
4. Photopoint and Data Collection ________________, 19__ By __________
5. Photopoint and Data Collection ________________, 19__ By __________
6. Photopoint and Data Collection ________________, 19__ By __________
7. Photopoint and Data Collection ________________, 19__ By __________
8. Photopoint and Data Collection ________________, 19__ By __________
9. Photopoint and Data Collection ________________, 19__ By __________
10. Photopoint and Data Collection ________________, 19__ By __________

Written evaluation completed __________________, 19__ By ______________

Appendix 7
Modified Cole Browse Method

The Modified Cole Browse method of individual plant selection (Fig. 7) will be used. Plants will be tagged sequentially for future identification.

The following information will be gathered and recorded in the fall, after the growing season and livestock and/or big game use period, and may be repeated in the spring after the period of big game use on those winter ranges where browse forage quantities are considered a factor limiting big game populations:

a. Plant species
b. Annual leader available (length)
c. Percent of leaders exhibiting use (0 to 100%)
d. Vigor (+, 0, or -)
   + = +10 points, 0 = 0 points, - = -10 points
e. Age Class
   Age Class data reflect the establishment, survival, and decadence of key browse plants. Observe the selected plant and record (by dot tally) the age class by species in the appropriate column on the form. The four age classes are as follows:

   S - Seedling - New plants that have survived at least one growing season, but are not more than two or three years old. The basal stems are generally 1/8 inch or less in diameter.

   Y - Young - Young plants usually less than 10 years old. Elongated growth form and simple branching with basal stems no greater than approximately [inch in diameter.

   M - Mature - Plants more than 10 years old. Distinguished by heavier, often gnarled stems, and complex branching. Canopy made up of more than 50 percent living wood. Basal stems are often greater than [inch in diameter.

   D - Decadent - Browse plants with more than 50 percent of the canopy area dead.

f. Form Class: Observe the selected plant and record the form class by species in the appropriate column on the form. (Figure 8)

   The form classes are as follows:

No.	Form Class
1	All available, little or no hedging
2	All available, moderately hedged
3	All available, severely hedged
4	Partially available, little or no hedging
5	Partially available, moderately hedged
6	Partially available, severely hedged
7	Unavailable
8	Dead

Figure 7

COLE BROWSE METHOD - TRANSECT SCHEMATIC

TECHNIQUE FOR SELECTING THE NEAREST PLANT

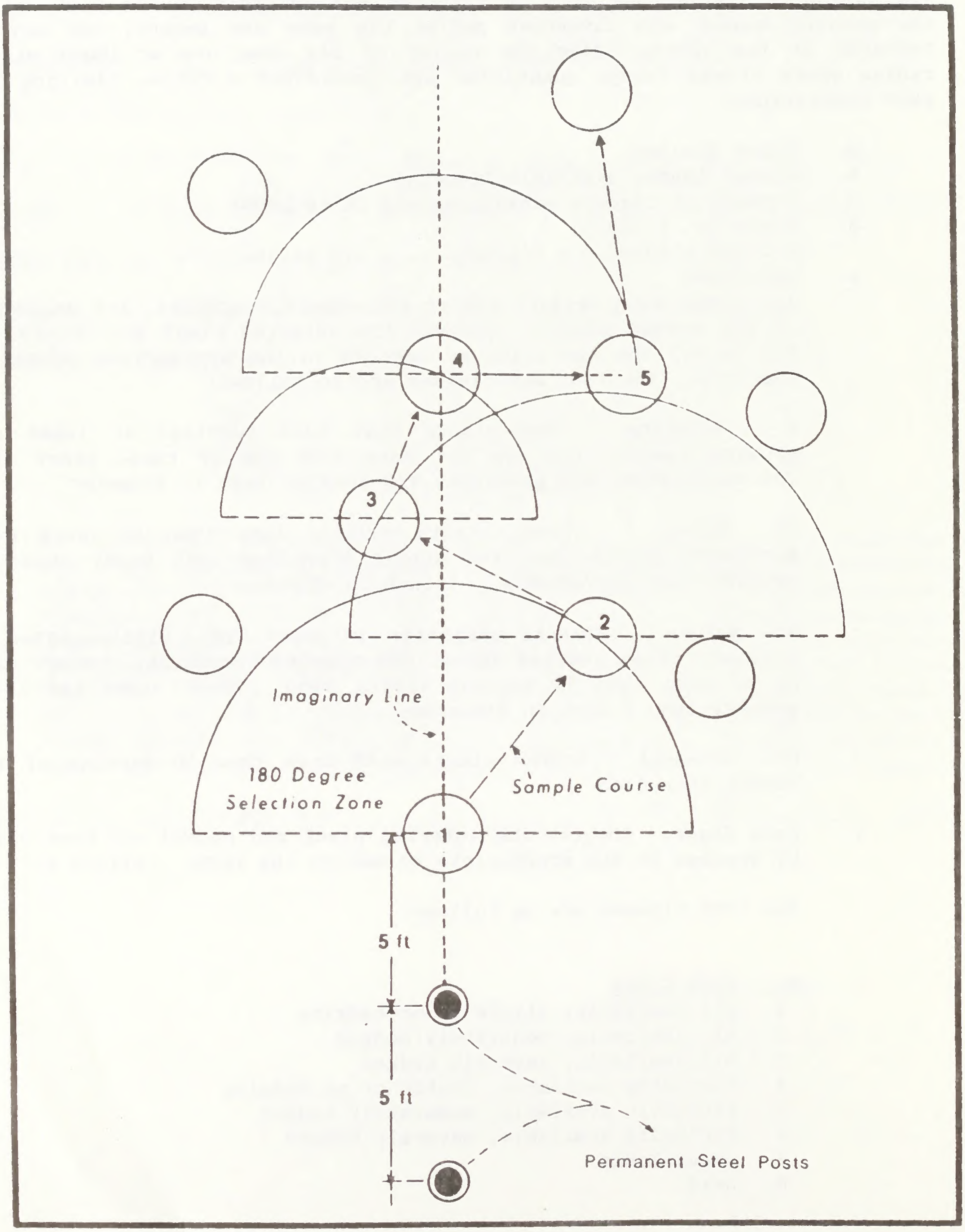


Figure 8

BROWSE UTILIZATION

Planning Unit ____________________

Examiner ____________________

Diagram of Transect:

Transect Name ____________________

Key Species Use Summary:

Species	Average % Total Leaders Used	Average Leader Length Used

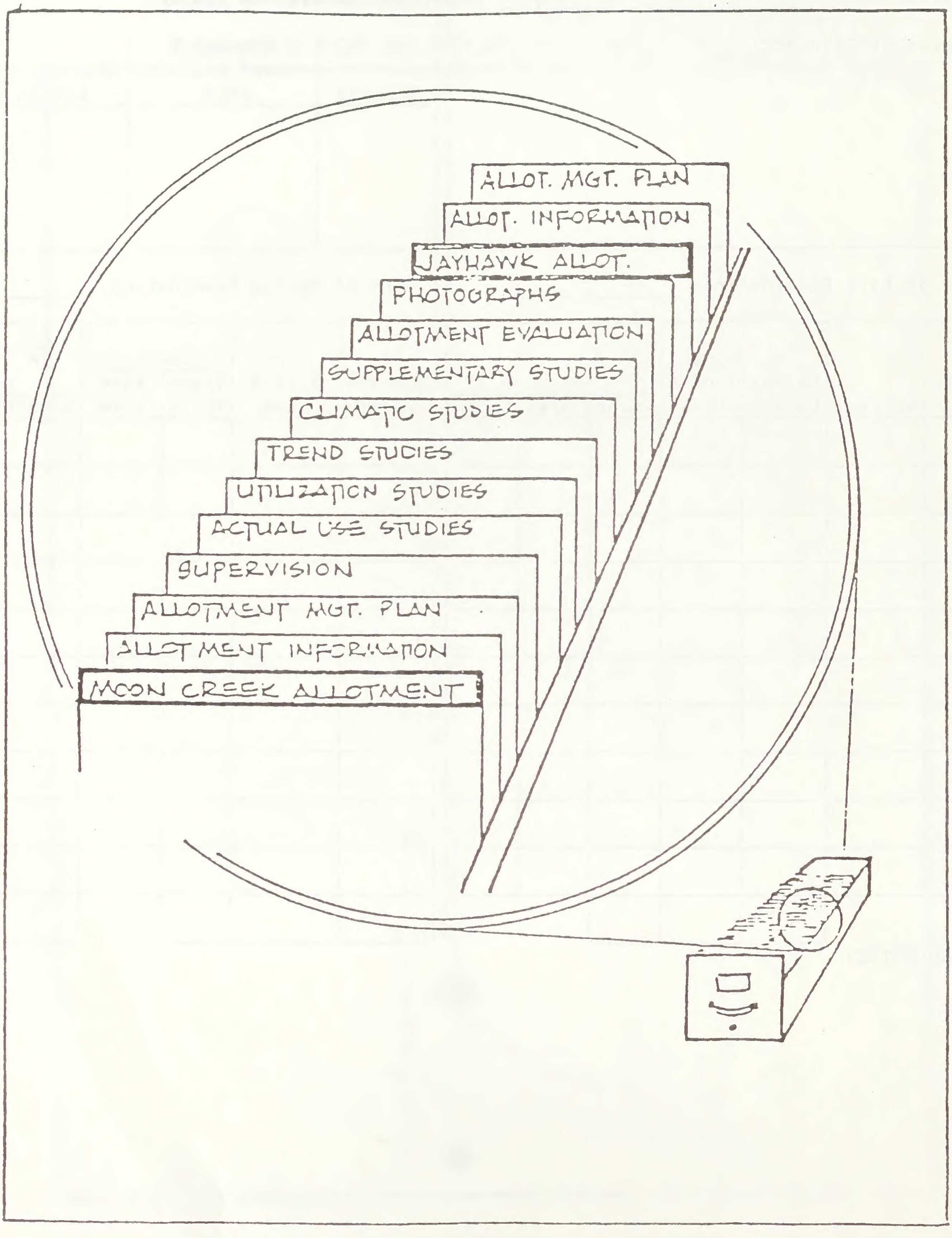
Date of Fall Examination ____________

Date of Spring Examination ____________

		A	B				C	D	Condition		$\frac{A-C}{A}$	D-B
Plant No.	Species	Leader Length	% of # Used	Condition			Leader Length	% of # Used	Vigor	Form	Use	
				Vigor	Age	Form			Vigor	Form	Length	Number
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												

FIELD NOTES:

Illustration 1
Record Keeping



LIST OF PREPARERS

Although individuals had primary responsibility for preparing sections of the monitoring document, the document is an interdisciplinary team effort.

Name and Office	Discipline
Task Force Members	
Jean Findley - Vale	Monitoring Specialist
Jim Hancock - Prineville	Associate District Manager Team Leader
Bob Kindschy - Vale	Wildlife Biologist
Joe Kraayenbrink - Lakeview	Range Conservationist
Bill Reimers - Burns	Range Conservationist
John Simons - Medford	Range Conservationist
Larry Walker - OSO	Range Resource Studies Specialist Technical Advisor
Scott Whittaker - Spokane	District Soil Scientist
Support Group	
Bill Brookes - OSO	Hydrologist
Tanya Graves - Prineville	Word Processing
Crystal Kreezan - OSO	Word Processing
Rosalie McFarland - Prineville	Word Processing
Bill Neitro - OSO	Wildlife Biologist
Robert Shotwell - Prineville	Writer/Editor

GLOSSARY OF TERMS

-A-

Allotment: An area of land designated and managed for grazing of livestock. Such an area may include intermingled private, State or Federal lands used for grazing in conjunction with the public lands. (See 43 CFR 4100.0-5.)

Analysis: (1) A detailed examination of anything complex in order to understand its nature or determine its essential features; or (2) A separating or breaking up of any whole into its component parts for the purpose of examining their nature, function, relationship, etc.

-B-

Best Management Practices: "Best Management Practices (BMP's)" means a practice or combination of practices, that is determined by a state (or designated areawide planning agency) after problem assessment, examination of alternative practices, and appropriate public participation to be the most effective, practicable (including technological, economic, and institutional considerations) means of preventing or reducing the amount of pollution generated by nonpoint sources to a level compatible with water quality goals (Federal Register Vol. 40, No. 230, November 28, 1975). BMP's also refer to a broader process of identifying practices and techniques that may be used to reduce water quality impacts. It is the latter concept that is used in summarizing state-of-the-art techniques and practices.

Browse: (1) the part of shrubs, half shrubs, woody vines, and trees available for animal consumption; or (2) to search for or consume browse.

Browse Plant of Browse Species: A shrub, half shrub, woody vine, or tree capable of producing shoot, twig, and leaf growth suitable for animal consumption.

-C-

Canopy Cover: The percentage of ground cover by a vertical projection downward of the outermost perimeter of the natural spread of foliage of plants. Small openings within the canopy are included. It may exceed 100 percent. Canopy cover is synonymous with crown cover.

Class of Livestock: The age and/or sex groups of a kind of livestock.

Climate: The average weather conditions of a place over a period of years.

Composition: The proportions (percentages) of various plant species in relation to the total on a given area. It may be expressed in terms of cover, density, weight, etc.

Condition: See Appendix 1.

Cover: (See Canopy Cover, Foliar Cover, and Ground Cover.)

Crop-Year Precipitation: That amount of precipitation received during the period September 1 to June 30. A crop-year is designated by the calendar year in which it terminates.

Crown Cover: (See Canopy Cover.)

-D-

Density: Numbers of individuals or stems per unit area. (Density does not equate to any kind of cover measurement.)

-E-

Ecological Site: See Appendix 1.

Ecological Status: See Appendix 1.

Evaluation: (1) an examination and judgment concerning the worth, quality, significance, amount, degree, or condition of something; or (2) the systematic process for determining the effectiveness of on-the-ground management actions and assessing progress toward meeting management objectives.

-F-

Foliar Cover: The percentage of ground covered by a vertical projection downward of the aerial portion of plants. Small openings in the canopy and intraspecific overlap are excluded. Foliar cover is always less than canopy cover. It may exceed 100 percent.

Forage: (1) browse and herbage which is available and may provide food for animals or be harvested for feeding; or (2) to search for or consume forage.

Forage Production: The weight of forage that is produced within a designated period of time or a given area. Production may be expressed as green, air dry, or even dry weight. The term may also be modified as to time of production such as annual, current year, or seasonal forage production.

Frequency: A quantitative expression of the presence or absence of individuals of a species in a population. It is defined as the percentage of occurrence of a species in a series of samples of uniform size.

-G-

Ground Cover: The percentage of material, other than bare ground, covering the land surface. It may include live and standing dead vegetation, litter, gravel, cobble, stones, boulders, and bedrock. Ground cover plus bare ground would total 100 percent.

Grazing Management: The manipulation of grazing and browsing animals to accomplish a desired result.

-I-

Interpretation: Explaining or telling the meaning of something and presenting it in understandable terms.

Inventory: The systematic acquisition and analysis of information needed to describe, characterize, or quantify resources for land-use planning and management of the public lands.

-K-

Key Area: A relatively small portion of rangeland selected because of its location, use, or grazing value as an area on which to monitor the effects of grazing use. It is assumed that key areas, if properly selected, will reflect the effects of current grazing management over all or a part of a pasture, allotment, or other grazing unit.

Key Species: (1) those species which must, because of their importance, be considered in a management program; or (2) forage species whose use serves as an indicator to the degree of use of associated species.

Kind of Livestock: Species of domestic livestock--cattle, sheep, horses, burros, and goats.

-M-

Monitoring: The orderly collection, analysis, and interpretation of resource data to evaluate progress in meeting management objectives.

-O-

Objective: Planned results to be achieved within a stated time period. Objectives are subordinate to goals, are narrower and shorter in range, and have increased possibility of attainment. Time periods for completion and outputs or achievements that are measurable and quantifiable are specified. (See goal.)

-P-

Pasture: Grazing area enclosed and separated from other areas by fence or natural barrier.

Plant Association: A kind of potential natural community consisting of stands with essentially the same dominant species in corresponding layers.

Plant Community: (See community.)

Potential Natural Community (PNC): See Appendix 1.

Production: (See Forage Production.)

Proper Use: (1) a degree of utilization of current year's growth which, if continued, will achieve management objectives and maintain or improve the long-term productivity of the site; or (2) the percentage a plant is utilized when the rangeland as a whole is properly utilized. Proper use varies with time and systems of grazing. Proper use is synonymous with proper utilization.

-R-

Rangeland: (1) A kind of land which supports vegetation useful for grazing on which routine management of that vegetation is through manipulation of grazing rather than cultural practices. (Rangelands include natural grasslands, savannas, shrublands, most deserts, tundra, alpine communities, coastal marshes, riparian zones, and wet meadows. Rangeland includes lands revegetated naturally or artificially to provide a plant cover which is managed like native vegetation.) (2) The terms "rangelands" or "public rangelands" means lands administered by the Secretary of the Interior through the Bureau of Land Management or the Secretary of Agriculture through the Forest Service in the sixteen contiguous Western States on which there is domestic livestock grazing or which the Secretary concerned determined may be suitable for domestic livestock grazing.

Resource Value Rating (RVR): See Appendix 1.

Riparian Zone: The banks and adjacent areas of water bodies, water courses, seeps, and springs whose waters provide soil moisture sufficiently in excess of that otherwise available locally so as to provide a more moist habitat than that of contiguous flood plains and uplands.

-S-

Selective Management Policy: A BLM policy whereby allotments are categorized according to the characteristics of natural resources within the allotment to determine whether management objectives should be established to maintain current satisfactory conditions (M Category), to improve current unsatisfactory condition (I Category), or to manage custodially to protect existing resource values (C Category). For more information and criteria to categorize allotments see Oregon BLM Instruction Memorandums 82-393 and 82-543.

Seral Stage: One of a series of biotic communities that follow one another in time on any given area. Seral community is synonymous with seral stage, successional community, and successional stage.

Succession: The orderly process of community change; it is the sequence of communities which replace one another in a given area.

-U-

Use: (See Utilization.)

Utilization: The proportion or degree of current year's forage or browse production that is consumed or destroyed by animals (including insects). May refer either to a single plant species, a group of species, or to the vegetation as a whole. Utilization is synonymous with use.

-V-

Vegetation: Plants in general, or the sum total of the plant life above and below ground in an area.

Vegetation Type: A kind of existing plant community with distinguishable characteristics described in terms of the present vegetation that dominates the aspect or physiognomy of the area.

Vigor: Relates to the relative robustness of a plant in comparison to other individuals of the same species. It is reflected primarily by the size of a plant and its parts in relation to its age and the environment in which it is growing.

-W-

Weather: The state of the atmosphere at a definite time and place with respect to air temperature, humidity, wind, precipitation, cloudiness, etc.

-Y-

Yield Index: An index of forage production based on crop-year precipitation adjusted to median precipitation; formula for computation in "Adjusting and Forecasting Herbage Yields in the Intermountain Big Sagebrush Region of the Steppe Province," Sneva and Britton, ARS-USDA, Bull. 659, 1983.

NT ADDITIONS
ER'S CARD
4/90 R37

785
in

	OFFICE	DATE RETURNED
9/17	NV-931.5	9/13/90
12/11	WY-036	12/7/90

(Continued on reverse)

BLM LIBRARY
SC-324A, BLDG. 50
DENVER FEDERAL CENTER
P. O. BOX 25047
DENVER, CO 80225-0047

DATE DUE

GAYLORD
PRINTED IN U.S.A.